PART F - SPECIAL CONSTRUCTION PROCEDURES

This Part contains information and guidelines for a number of commonly used Special Provisions. **[101.74]** The Special provisions are not used on every project, and they change more frequently than the Standard Specifications. Special Provisions will have Pay Item numbers of the form xxx5xx or xxx6xx.

The Inspector should review both the Special Provisions and the relevant sections of the Manual at the beginning of every project, even if a particular Special Provision was used on the last project the Inspector was involved with.

DIVISION F200 – EARTHWORK

SECTION F202505 – SETTLEMENT PLATFORM

F202505.01 General. This work consists of furnishing all materials and constructing settlement platforms.

Settlement platforms provide a simple, permanent method of determining the amount of settlement of an embankment. Settlement will occur almost every time a load is placed on underlying soil, whether it is the natural ground surface or a thoroughly compacted embankment. If the soil settles more than anticipated, though, it can cause instability of a foundation, cracking of a pavement surface, or damage to a bridge or other structure. Therefore, while settlement platforms are relatively simple, proper installation is critical to the overall quality of the road or structure being built.

F202505.02 Construction Methods. Settlement platforms consist of steel plates and riser pipes. The plates are placed on the ground surface; the pipes are attached to them so that they extend vertically upward. Embankment material is then gradually placed over the settlement platforms. As settlement occurs, the steel plates and attached pipes will sink into the ground.

The Contractor is responsible for furnishing, installing, and maintaining the settlement platforms for the length of the Contract. When settlement platforms are required on the Project, the Inspector should observe the following:

(a) Ensure that the settlement platforms are level before any embankment material is placed on them. Settlement platforms that are not level can result in inaccurate settlement readings.

(b) Ensure that the pipes are vertical at all times.

(c) Ensure that the Contractor extends the pipes as required. **[Special Provision 202505]**

(d) Note any damage that occurs to the settlement platforms, and ensure that the Contractor repairs or replaces all damaged platforms. The Contractor is not allowed to place any embankment material within 20' (6 m) of a damaged settlement platform.

Readings on the settlement platforms will be taken a Survey Party.

SECTION F202528 – PIEZOMETER

F202528.01 General. This work consists of furnishing all materials and drilling a bore hole, fabricating and placing the piezometer stand pipe, filling the annular space with filter pack and grouting material, constructing the steel outer casing and developing the piezometer in reasonably close conformity to the locations and typical details shown on the plans.

Piezometers are devices used to measure pore water pressure at a given point or depth in the foundation material. Piezometers consist of a porous intake connected to the ground surface by a riser pipe or pipes. The pore water pressure can be observed by the use of gauges, manometers, or directly by sounding devices.

The installation of piezometers is a highly specialized procedure and is usually inspected by a soils engineer or technician from the Materials and Research Section. The Inspector, however, is responsible for ensuring that the piezometers are installed as shown on the Plans. The Inspector is also responsible to record the piezometer readings using the form shown in Part H.

DIVISION F300 – BASE COURSES

SECTION F304502 – SOIL CEMENT BASE COURSE

F304502.01 General. This work consists of preparing and constructing a base course with a mixture of soil and portland cement, using existing or selected soil or aggregate, uniformly mixed in place with portland cement and water.

F304502.02 Materials. Portland cement should be in conformance with Section 812 of the Specifications.

Water should be in conformance with Section 803 of the Specifications.

Soil should be borrow material in conformance with Subsection 209.04, Borrow Type D, of the Specifications.

The Contractor is required to contact the Materials and Research Section 30 days before it is anticipated that soil cement operations will begin. This 30-day period will be used to determine the required proportions of cement and water for the soil cement mixture. The Contractor must stockpile soil from the borrow source approved for use for soil cement stabilized base. Stockpiling is to be done to the satisfaction of the Engineer.

F304502.03 Preparation of Subgrade. The subgrade should be prepared and shaped in accordance with the Specifications **[202.06]**. Soft or spongy areas in the subgrade should be removed, replaced, and properly compacted with satisfactory material. All drainage conduit, including underdrain if required, should be in place before placing soil cement begins. The subgrade should be moist and free of water puddles.

F304502.04 Contractor's Construction Procedure. The preconstruction meeting should include a discussion of the construction procedure if the procedure is specified in the Contract. If the procedure is not specified in the Contract, the Contractor should submit its construction procedure for approval. The construction procedure should include the method for controlling traffic, the source of the soil to be used if known at that time, the paving pattern, and the methods of pulverizing the soil, distributing water, mixing, shaping, compacting, and curing the layer. The Inspector should review the construction procedure before work begins on the soil cement base course, and should ensure that the Contractor has submitted or reviewed the construction procedure as required.

F304502.05 Equipment. The Inspector should inspect all equipment, including the pulverizers, rototillers, water wagons, graders, pneumatic-tire and steel-wheel rollers, and all other equipment specified or proposed for use, for conformance with the Specifications. **[108.06]**

F304502.06 Mixing. Special Provision 304502 permits either batch or continuous flow-type mixing plants. The most common types of mixing plants are pugmills and rotary drums.

The pugmill mixer consists of revolving blades or paddles on a shaft. There may be one or two shafts in the mixer, depending on its capacity. The mixer is charged from the top and discharged through the bottom when accomplishing batch mixing; and charged at one end and discharged at the other end during continuous mixing. The quantity of material in the mixer is controlled by batch weights or volumes in batch mixing and by adjustable vertical gates in continuous mixing.

Rotary drum mixers employ the same mixing principle as a concrete paver, wherein paddles, studs, or flights are made a part of the revolving drum, which affords a mixing action as the drum rotates.

The design of the mix plant is left to the Contractor, although the plant must be approved before use. Special Provision 304502 requires that the mix plant should not permit water to be mixed with the cement until the cement has been mixed with the soil. The mix plant should have an adequate supply of all materials needed, and should store them as required in Special Provision 304502. The Inspector should ensure that the mix plant is in accordance with the Specifications while it is used on the Project. **[105.02]**

The addition of water in the mixing operation is important to the quality of the cement treated base, the spreading, and the compaction to follow. The desirable time period for the addition of water into the mixing operation can be determined by observation and performance on the specific project. Experience shows that there is some advantage to delaying the addition of water a few seconds in order to receive the initial benefit from a limited amount of dry mixing of cement and aggregate. When preparing for a continuous mixing process, the water may be added as the aggregate and cement progress through the mixer following a preliminary dry mixing period. Water added to the mixture through the "spray process" facilitates the mixing operation, improves distribution, offers increased production, operation, and improves the spreading and compaction operation. The amount of water added is that necessary for hydration of the cement and subsequent compaction. Normally the amount of water added is close to the optimum moisture content for compaction. The addition of cement into the mixture in a uniform manner and in the desired amount is an important step in the mixing process that has an important impact on the finished product. Proportioning cement by weight in batch mixers is generally the most successful method of ensuring that the required amounts are processed.

The feeding of cement on continuous type mixers is generally performed with continuous flight augers or vane feeders. Because cement will occupy different volumes under different conditions, it is difficult to ensure accurate delivery of the desired weight percentage. The more popular cement feeders now attempt to deliver cement from a constant head receiver in which the cement is agitated by air or other methods to allow for a uniform condition for delivery to the mixer. The Inspector should ensure that cement is added to the mixture uniformly, no matter which type of delivery system is used.

With the advent of the cement titration test, there is now available to the Engineer or Inspector a control test that may be performed in a reasonable amount of time to check the performance of the mixing operation. Special Provision 304502 includes the allowable tolerance for variation in the cement content of the soil cement mixture. Readings that are not within the specified tolerances are not acceptable. The Contractor is responsible for the control and delivery of all ingredients to the mixer within the specified tolerances. It is important that all necessary inspections required to ensure uniform operations and control are conducted.

> The Contractor is responsible for the satisfactory delivery of soil cement that is in conformance with the Specifications.

F304502.07 Spreading. The spreading equipment is to be approved by the Engineer before spreading begins. The Inspector has a responsibility to ensure that the spreader used on the Project is the same one approved by the District Construction Engineer and performs in

accordance with the Specifications. It is important for the Inspector to check the settings of the screed on the spreader and to observe the spreading operation closely. The resulting cross section of the completed base course is controlled by the spreading operation.

The rate of spreading should be determined by the Contractor's ability to perform all mixing, compacting, and curing of the spread material in accordance with the Specifications.

F304502.08 Compaction. At the start of compaction, the moisture content of the mixture must be within 2 percent of the optimum moisture content, and must not be at a level that causes the soil cement layer to become unstable during compaction and finishing. Prior to beginning compaction, the mixture should be in a loose condition for the full specified depth. The loose material is to be compacted within 2 hours of when the soil cement was mixed.

Compaction may be accomplished by sheepsfoot, wobbly-wheel, pneumatic-tire, or steel-wheel rollers in the combination required to produce the required density. During the compaction operations, shaping will be necessary to obtain uniform compaction and the required grade and cross section.

F304502.09 Joints. At the end of the day's run, the transverse joint is to be shaped to a vertical plane at right angles to the centerline of the roadway. All longitudinal joints should be shaped approximately to a vertical plane. The vertical face of the transverse joint is to be protected until compaction begins on the adjacent section of soil cement base course. Tapered joints, either longitudinal or transverse, are not to be permitted.

F304502.10 Curing. After the treated base has been completed as specified in the previous sections, the material should be protected from drying by applying asphalt to all exposed surfaces. The bituminous material should be applied as soon as possible, but no later than 24 hours after completion of finishing operations. The finished soil cement layer is to be kept continually moist until the curing material is placed. The bituminous curing material and protective sand cover shall be maintained and replaced if necessary by the Contractor so that all soil cement will be protected from damage. The Contractor should maintain the curing material until a subsequent pavement course is placed to protect the soil cement base.

The Area Engineer/Construction Manager may authorize curing by water instead of asphalt. If water curing is used, the water should be applied within 2 hours of compaction and every 2 hours thereafter until the soil cement base course has cured to the satisfaction of the Engineer.

The Area Engineer/Construction Manager may also authorize curing with a white pigmented curing compound instead of asphalt. The Inspector should ensure that the material and application rate are in accordance with the Specifications.

Provisions should be made for protection against freezing for a period of seven days after compaction.

F304502.11 Testing. The thickness and surface smoothness of the soil cement base course should be tested by the Inspector. The thickness should be tested immediately following finishing operations using the procedure described in the "Tolerances" section of Special Provision 304502. The smoothness should be tested during and after compaction and finishing operations using the procedure described in the "Tolerances" section of Special Provision 304502. If the thickness or the surface smoothness of the soil cement base course are not in

conformance with Special Provision 304502, the Inspector should ensure that the Contractor takes the appropriate corrective actions as described in the Special Provision.

F304502.12 Opening to Traffic. Completed portions of soil cement base course may only be traveled on by the Contractor's equipment used for the placement of permeable treated base and only after the soil cement base has cured for 7 days, provided the layer has hardened sufficiently to prevent marring or distortion of the surface. **[Special Provision 304502]**

F304502.13 Measurement and Payment. The Inspector should measure the number of square yards (square meters) of soil cement placed and the amount of cement used. The Inspector should review Special Provision 304502 to determine what portions of the work are paid for under this Contract Item and what portions are paid for under other Items in the Contract.

DIVISION F600 – MAJOR STRUCTURES

SECTION F614861 – STRUCTURAL PLATE ARCH (STEEL)

F614861.01 General. This work consists of furnishing, fabricating, and installing a corrugated steel structural plate long-span structure, including stiffening members where required.

F614861.02 Assembly. The Contractor is required to have a manufacturer's representative on site when structural plate arches are being assembled and installed. This is to ensure that the structural plate arch is assembled properly, and to provide assistance should a problem arise during installation. If the manufacturer's representative is not present, the Inspector should ensure that the Contractor does not perform any work on the structural plate arch.

The bed for the structural plate pipe or pipe arch is to be prepared in the same manner as stated in Subsection E608.02. Normally the method of assembly used by the Contractor for structural plate arches is to place the bottom, or invert, plates first, starting at the downstream end, and then to place each additional bottom plate lapping the top of the preceding plate. The side and top plates are started at the upstream end and succeeding plates are added to lap the outside of the preceding plates. The plates are lapped one corrugation. This order of work makes the inside of the lap point downstream, providing a shingled effect to the inside of the pipe.

Bolts are placed with the heads in the valleys of the corrugations and the nuts on the crest. Extra length bolts are used to draw the plates together whenever necessary and later replaced with standard length bolts.

F614861.03 Backfill. Backfilling structural plate arches is to be in accordance with the Plans and Specifications. **[Special Provision 614861]** The Inspector should ensure that the difference in backfill elevation between the two sides of the structure is never more than 1' (300 mm). The Contractor should never backfill adjacent to the arch with embankment that is formed of stone and rock. The structure could be damaged if the stone and rock fill are not properly placed.

The structural plate arch can be damaged in a number of ways during construction. Damage can occur if the compaction equipment is too heavy or the backfill is not thick enough before it is compacted. The first lift of backfill on the top of the structure is to be 1' (300 mm) thick. The initial lift must be compacted by small equipment that will not damage the arch. Damage can occur if any construction equipment is operated over the structural plate arch before it has been completely backfilled and compacted. The Inspector should be aware of construction operations that may damage the structural plate arch. Some operations, such as operating equipment over the structural plate arch, may be performed at the Contractor's own risk, while other operations are prohibited. The Inspector should check the Specifications to determine what is and is not allowed, and ensure that the Contractor does not perform any prohibited operations. Any operations, whether prohibited or not, that may cause damage to the structural plate arch should be brought to the Area Engineer's attention.

SECTION F619500 – DYNAMIC PILE TESTING BY DELDOT

F619500.01 General. This work consists of dynamic pile testing performed by the Department.

Dynamic pile testing is performed by the Materials and Research Section as pile driving is performed. The Contractor is required to attach monitoring sensors to the piles before driving. The equipment used for dynamic pile testing is furnished by the Department.

The Contractor is to make the piles to be monitored available to the Engineer at least one working day before driving is scheduled. The Contractor is to provide access to the pile after it is placed. The Contractor is to provide an access platform for the Engineer as specified in Special Provision 619500. The Contractor is to provide any labor necessary to assist the Materials and Research Section in performing dynamic pile testing.

The Inspector should ensure that the Contractor has met the requirements of the Specifications prior to dynamic pile testing. The Inspector should ensure that the pile is positioned as shown on the Plans and driven in accordance with the Specifications. Refer to Section E619 for more information on the Inspector's duties during pile driving.

SECTION F619508 – QUICK PILE LOAD TESTS

F619508.01 General. This work consists of furnishing all materials, equipment, tools, and labor necessary to perform a static axial compressive load test.

The purpose of the quick pile load test is to obtain the ultimate pile bearing capacity of a pile or to ascertain that the pile can bear a specific capacity without failure. The test is performed by loading a pile to 200% of its allowable bearing capacity after the pile has been driven. The Inspector should become familiar with the test procedure. The test procedure is a modification of ASTM D 1143. The Inspector must obtain a copy of ASTM D 1143 from the Bridge Design section. The Inspector should ensure that the Contractor follows the requirements of Special Provision 619508 where it modifies the requirements of ASTM D 1143. The Inspector should inform the Bridge Design Engineer when the test will be conducted.

The Contractor is to submit drawings and calculations for review 30 calendar days before the work is scheduled to begin. It is also required to provide experienced personnel to perform the quick pile load tests. The Inspector should ensure that the resumes of the personnel have been submitted to the District Engineer for approval. The pile driving equipment used to drive the test piles should be the same as that intended for driving the service piles. After the quick pile load test, the Contractor is to complete a Pile Load Test Report for each load test performed and submit three copies of the report to the District Engineer.

Refer to Sections 618 and 619 of the Specifications and Section E619 of this Manual for more information on pile materials and pile driving. Refer to Section G602 of this Manual for information on pile driving equipment.

SECTION F620527 – MODIFIED QUICK PILE LOAD TEST

F620527.01 General. This work consists of furnishing all materials, equipment, tools, and labor necessary to perform a static axial compressive load test.

The purpose of the modified quick pile load test is to obtain the ultimate pile bearing capacity of a pile or to ascertain that the pile can bear a specific capacity without failure. The test is performed by loading a pile to 300% of its allowable bearing capacity after the pile has been

driven. The Inspector should become familiar with the test procedure. The test procedure is a modification of ASTM D 1143. The Inspector should ensure that the Contractor follows the requirements Special Provision 619508 where it modifies the requirements of ASTM D 1143.

The Contractor is to submit drawings and calculations for review sufficiently ahead of schedule so that there is time for review, corrections, and discussion before the work is scheduled to begin. The Contractor is required to provide experienced personnel to perform the quick pile load tests. The Inspector should ensure that the resumes of the personnel have been submitted to the Engineer for approval. The pile driving equipment used for driving the test piles should be the same as that intended for driving the service piles. After the quick pile load test, the Contractor is to complete a Pile Load Test Report for each load test performed and submit three copies of the report to the Engineer.

Refer to Sections 618 and 619 of the Specifications and Section E619 of this Manual for more information on pile materials and pile driving. Refer to Section G602 of this Manual for information on pile driving equipment.

SECTION F622508 – PRECAST PRESTRESSED CONCRETE SHEET PILES

F622508.01 General. This work consists of manufacturing, furnishing, driving, cutting off or building up, and performing other incidental work for precast, prestressed concrete sheet piles.

F622508.02 Inspection Procedures. The requirements for fabrication, handling, and driving precast, prestressed concrete sheet piles are fully described in Special Provision 622508. The Inspector should ensure that the Contractor follows the Plans and Specifications carefully in performing this work. The following list is provided to aid the Inspector in the inspection of precast, prestressed concrete sheet piles:

(a) Verify that all materials are in conformance with the Plans and Specifications, and that the Materials and Research Section has performed all required inspections.

(b) Ensure that all piles are manufactured within the tolerances specified in Special Provision 622508.

(c) Ensure that all piles are stored and handled in accordance with the Specifications. Do not allow damaged piles to be used on the Project. **[106.07]**

(d) Ensure that pile hammers, helmets, cushions, leads, and followers are approved by the Engineer and are in good operating condition. Any changes in equipment from what was used to drive the test piles should be brought to the Engineer's attention immediately. Refer to Section G602 for more information on pile driving equipment. **[108.06]**

(e) Check that all piles are properly positioned prior to and during driving.

(f) Observe all pile driving operations to ensure that the piles are not damaged during driving.

(g) Check all piles for heaving during the driving of adjacent piles. Ensure that the Contractor re-drives all piles that heave upwards more than 1/4" (6 mm).

(h) Ensure that the vertical alignment of all piles is in accordance with the Plans or the directions of the Engineer, and that the tops of all piles are within 3" (75 mm) of the position shown on the Plans after driving.

(i) Keep a copy of the Contractor's driving sequence for all piles located at the abutments, and ensure that the Contractor follows this driving sequence unless the Engineer allows changes in the sequence.
(j) Ensure that all driven piles are cut off at the proper elevation.
(k) Check adjacent areas for possible damage due to pile driving.

DIVISION F700 – MISCELLANEOUS CONSTRUCTION

SECTION F715501 – WICK DRAIN

F715501.01 General. This work consists of furnishing all materials and installing vertical plastic drainage wicks.

Wick drains, also called strip drains, are used to stabilize soils that contain a large amount of water. Soils with a high water content are not very stable, and can not support a large load. If enough water can be squeezed out of the soil, the soil can be consolidated, and made more stable. Using wick drains, areas such as marshland can be made suitable for use in the construction of highways and large structures.

In order to stabilize soils, a large portion of the water needs to be removed from the soil. This is often difficult because these unsuitable soils often extend far below the ground surface. To stabilize these soils, water needs to be removed from the entire layer of the soil, which means removing water from deep underground. In the 1930s, a technique was developed that used sand to remove this water. The sand was placed in vertical holes that were dug for the full depth of the soil layer to be drained. Sand is much more porous than the silt and clay that make up the unsuitable soils, so water flows more easily through the sand than through the unsuitable soil. After the sand was placed, a layer of soil called a surcharge was placed on top of the ground. This surcharge layer was often as much as 30' (9 m) deep. The surcharge placed a load on the unsuitable soil below it which would effectively squeeze the unsuitable soil, much as one might squeeze a sponge. Squeezing the soil forced water that had flowed into the sand to move upward toward the ground surface. As the water reached the surface, drains would carry it away from the site. Water would then flow into the sand in the ground to replace water that had been drained away. Over time, the water would be removed from the ground, and the soil would become suitable for construction.

The concept of stabilizing a soil layer with vertical drains is relatively simple, and has been around for over 60 years. Advances in technology, though, have led to innovations in the materials used. The use of sand in vertical drains has been replaced with geosynthetics, which are plastics that are designed for earthwork applications. Plastics can be used to make a number of different products, from hard PVC pipes to soft, flexible polyester erosion control blankets. By combining different types of plastics, products can be designed to perform a number of specialized functions, including acting as a vertical drain, called a wick drain.

A wick drain is made up of two components: a hard plastic core and a geotextile, or plastic-based fabric, cover material. The plastic core provides strength and rigidity to the wick drain. It also has channels cut into it that allow water to flow more easily. The geotextile holds the water in the drain and facilitates the flow of water up the drain to the ground surface. Water flows through the wick drain for the same reason it flows through a sand drain: the surcharge load applies a pressure that forces the water through the geotextile. However, there is even less resistance to flow in the wick drain than there is in sand, therefore the soil layer can be drained even faster. Furthermore, wick drains are easier to install than sand drains, and require smaller equipment for installation. For these reasons, wick drains are rapidly replacing sand drains on most construction projects.

F715501.02 Materials. The material requirements for wick drains are well defined in the Special Provisions. **[715501]** The Contractor is required to submit samples of the material to be used in the wick drains to the Materials and Research Section sufficiently ahead of time to allow

the Engineer two weeks to review the material. The Inspector should ensure that the Contractor has submitted these samples. The Inspector should also ensure that all other materials have been approved by the Materials and Research Section as required before the Contractor begins construction.

F715501.03 Construction Procedures. The Contractor is required to submit the sequence and method of installation of the wick drains at least two weeks before work begins on this operation. The Inspector should review the sequence and method of installation and ensure that the Contractor does not vary from its plan without prior approval from the Engineer.

Installation of wick drains is composed of three steps: placement of the drainage blanket, driving of the wick drains, and placement of the filter fabric.

(a) *Placing the Drainage Blanket.* The drainage blanket is a layer of sand that carries water from wick drains to collector drains or to beyond the limits of fill without significant head loss. The sand blanket is generally placed directly on the natural ground surface.

The sand for the drainage blanket should be spread uniformly over the area by methods that will not disturb the in-place soil. The sand blanket may be placed by hydraulic means or by the end-dump method. If the end-dump method is used, it may be necessary to place a working mat for the equipment. A working mat is a layer of material that is thick enough to support the construction equipment. The working mat is placed over the unsuitable soil when there is the possibility that the unsuitable soil will not support the construction equipment.

The Contractor is required to stake the locations of the wick drains after the drainage blanket has been placed. The Inspector should ensure that the locations staked are within 6" (150 mm) of the positions shown on the Plans, or within 6" (150 mm) of the locations the Materials and Research Section indicates for wick drain installation.

(b) *Driving the Wick Drains.* Wick drains are installed using a piece of equipment called a "sticker." The sticker consists of a long, thin mandrel that is pressed into the ground to the required depth. The wick drain material arrives on the site in rolls that are placed on the sticker. The end of the wick drain material is threaded to the bottom of the mandrel and looped around an anchor plate or bar as shown below.

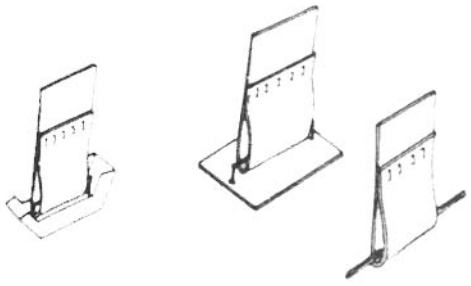

Figure F-1: Wick Drain Anchoring Devices

After the wick drain material has been attached to the anchor, the mandrel is driven into the ground to the required depth. The Inspector should observe the

depth of the installed wick drains to ensure they are driven to the required depth. The mandrel is then withdrawn, and the wick drain is cut off below the top of the drainage blanket. The Inspector should observe the following while wick drains are being driven:

(1) The mandrel must be positioned exactly over the stake marking the location of the wick drain.

(2) Before commencing the driving, the mandrel must be within 1 inch/foot (80 mm/m) of the vertical.

(3) Since an accurate driving record will be kept for each wick drain, the number of the wick drain, which should be marked on the stake, must be recorded.

(4) If obstructions are encountered that prevent a wick drain from being driven, the Engineer should be contacted.

(c) *Placing the Filter Fabric.* After the wick drains have been driven, a filter fabric is placed over the drainage blanket as shown on the Plans. The Inspector should ensure that the filter fabric completely covers the drainage blanket and has no holes or tears.

During the placement of the overburden material, the Inspector should monitor the wick drains and record their performance. The Inspector must never allow the Contractor to place overburden quicker than the placement rate noted on the Plans.

SECTION F742500 – FLAGGER

F742500.01 General. Flagger shall consist of furnishing personnel and necessary equipment for the control of traffic through work areas.

F742500.02 Qualifications and Responsibilities. Flaggers are in a very dangerous, yet extremely important, position, and play a critical role in Temporary Traffic Control (TTC). The safety of workers, motorists and pedestrians is dependent upon the flagger's performance. It is extremely important that the flagger be alert, properly dressed, in the correct location, and facing traffic while flagging. The job of the flagger is an important one. Flagger mistakes could expose motorists, workers and pedestrians to serious hazards, including loss of life. As with any position, proper training is essential and vital. The Delaware Contractor's Association (DCA) and the National Safety Council (NSC) both offer flagger certification courses. All flaggers working along Delaware roadways, on Department construction projects with the updated flagger Special Provision, must be trained, tested and approved under a Department-approved flagger certification course.

Flaggers are governed by:

(a) the Manual on Uniform Traffic Control Devices (MUTCD) Part VI, December 2000 edition, and updates;

(b) Delaware's Traffic Controls for Streets and Highway Construction, Maintenance, Utility and Emergency Operations (revised 23 July 01) and updates;

(c) the appropriate sections of the applicable Specifications and updates;

(d) the guidelines outlined in this document.

The American Traffic Safety Services Association (ATSSA) and the National Safety Council (NSC) flagger certification training programs are the approved programs. The flagger

certification trainers must be approved by the DelDOT Safety Section. All certified flaggers must appear in the ATSSA or NSC database for certified flaggers.

Flaggers are required to pass a Department-approved flagger certification test, given by DCA or NSC, to prove their proficiency and competence level. Flaggers need to be good communicators. The prospective flagger (applicant) must take a hands-on test, during which the applicant will be graded on his or her performance. If the applicant passes the hands-on portion of the test, then and only then, will the applicant be able to take the written exam. If the flagger fails any portion of any test, he or she should review the material or be retrained before retesting.

DCA and NSC will provide training to interested parties at their convenience. Only DCA and NSC-approved personnel will be allowed to administer the tests and have copies of the tests, and these tests are required to be kept under lock and key in a safe, secure place.

The Department may accept Flagger Cards issued by the Maryland State Highway Administration (MDSHA). The Department retains the right to request that the flagger provide written documentation from MDSHA as to the authenticity of the certification card.

Flaggers must be completely covered (clothed) from neck to feet. The minimum clothing requirements for flaggers are long pants, a standard T-shirt with sleeves, and appropriate footwear (no open toe shoes). The Flagger must wear orange colored headgear and a Department-approved vest over his or her outer clothing. For nighttime and low visibility conditions, the Flagger shall use a vest made completely of high intensity, retro-reflective material.

Flaggers are required to use Department-approved STOP/SLOW (S/S) paddles as hand signaling devices. Flags are generally only allowed for emergencies. S/S paddles are required to meet all Manual of Uniform Traffic Control Devices (MUTCD) requirements specified in Section 6E.03. They must be octagonal in shape. Any border around the SLOW side must be black. S/S paddles must be a minimum of 24" (610 mm) square with minimum 8" (200-mm) high, “C” series letters on the STOP side of the paddle and 8" (200-mm) high, “B” series letters on the SLOW side of the paddle. S/S paddles are required to have high intensity sheeting for the orange, red, and white colors (both day and night). A rigid handle must be provided such that the bottom of the sign paddle will be 6' (1.8 m) above the ground. Flagger stations must be sufficiently illuminated at night. Care must be taken to ensure that traffic is not blinded from any direction of travel by illumination of the flaggers’ station.

Failure of a flagger to perform the required duties correctly will be justification for the Engineer to suspend work in conformance with Subsection 108.06 of the Standard Specifications. The flaggers must be replaced, and when the flaggers are in compliance with the policies outlined in this program, the work may resume.

Flagger Cards may be confiscated from personnel flagging improperly. The Engineer will contact the Contractor’s supervisor. The supervisor will confiscate the card from the flagger. The card must be turned over to the Engineer and forwarded to DelDOT’s Safety Section. The Safety Section will forward the card to DCA, NSC, or MDSHA. The computer listing will indicate that the flagger’s card has been removed. Any flagger whose card has been confiscated must be retrained and retested prior to consideration for reinstatement. Retraining and retesting will not occur until at least one month after the infraction.

Flaggers are required to have their approved flagger card on their person at all times while flagging. Failure to produce an approved card, when requested to do so by anyone authorized by the Department, is grounds to have that person removed from the flagger job.

F742500.03 Location of a Flagger. Contractors are to position the flagger just outside the approaching traffic lane. The position should be in close proximity to the workers to afford protection, but provide a safe and reasonable distance between construction and traffic movement. The flagger's station is to be at least 100' (30 m) ahead of the working area. Consideration must be given to visibility and location in regard to curves and hills. Flaggers are to be placed so that approaching drivers can see the flagger's paddle from at least 500' (150 m) away. The flagger's position is to be such that the paddle is visible in the traffic lanes to be controlled, and the flagger must be careful not to jeopardize his or her own safety. Flaggers should be positioned in a highly visible location to oncoming traffic. They should always watch traffic and be ready to avoid any approaching vehicle that appears hazardous.

F742500.04 Method of Signaling. When signaling traffic to stop, slow down, or proceed, the flagger must face the traffic to be affected by the signal. The paddle is not to be waved. Particular attentions is to be given to the control of traffic when operations are being conducted on a curve or hill and are hidden from the view of approaching traffic.

F742500.05 Signals. The flagger uses standard signals to control traffic, which are outlined below. Occasionally, traffic passing by the flagger will ask a question about the work. When talking to the traveling public, the flagger should be courteous but firm when describing the hazards. Explanations should be stated clearly and briefly, such as "There are workers in the trees overhead," or "There is fresh oil on the road ahead". Flaggers are to be cautioned never to lose their temper or become involved in arguments with the traveling public.

The following are some of the standard signals used by flaggers.

(a) *Stop*. When stopping traffic, the paddle is to be extended in a vertical position so that the full area of the paddle is visible. With the hand not holding the paddle, traffic should be brought to a halt by raising and extending the hand with the palm facing the oncoming traffic. Refer to Figure F-2.

(b) *Slow*. When slowing traffic without stopping, the paddle should be extended in a vertical position. With the hand not holding the paddle, traffic is motioned to proceed. Refer to Figure F-2.

(c) *Proceed*. To request traffic to proceed after stopping, the flagger should stand to the side of the traffic lane and show the "slow" side of the paddle. With the hand not holding the paddle, traffic is motioned to proceed. The paddle is never used for signaling traffic to proceed. Refer to Figure F-2.

(d) *To Move Traffic to Another Lane*. The flagger should show the "slow" side of the paddle and motion oncoming traffic with the free arm and hand. The free hand and arm should be moved in the direction traffic is desired to flow. Pointing in the direction of the desired traffic flow may also be done.

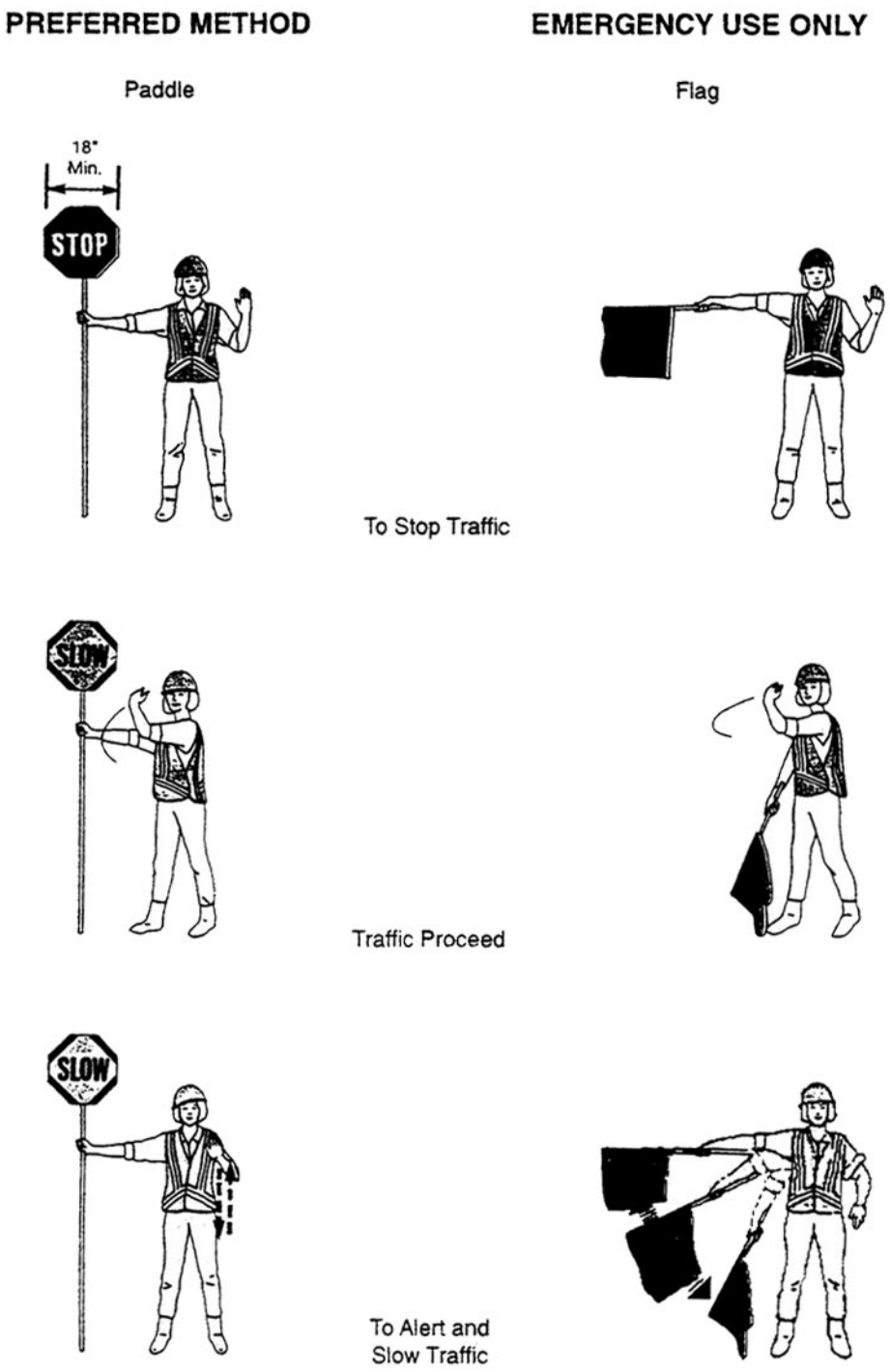

Figure F-2: Traffic Flagger Signals

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